

**REMARKS*****Generally***

As of the Final OA, Claims 21 – 30 are pending in the application and stand rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. The Examiner's suggestions regarding corrections to the drawings and specification are appreciated. The undersigned has attended to each suggestion, thereby clearing each objection.

Regarding the rejection of Claims 21 – 30 under 35 USC §101, application of the PTO's own training materials with regard to "useful, concrete, and tangible" shows that the claimed invention meets these criteria.

***Drawings***

The Final OA requested that Figures 8, 18, and 20 be corrected. Each of these figures has been corrected. A complete set of replacement figures, e.g., Figures 1-30, is provided with this Reply.

***Specification***

The Final OA noted four (4) typographical errors and one area of inconsistent notation in the current specification. Each of the typographical errors have been corrected. In addition, the specification has been amended to provide consistent notation in the cited paragraphs. A Substitute Specification (in both redlined and clean versions) is provided with this Reply. Paragraphs [0068, 0076, 00100, 00123, 00125, 00127, 00130] have been amended to correct typographical errors and inconsistent notations.

***Claim Rejections – 35 USC §101***

The Final OA appears to repeat the assertions of the Office Action of 08/25/2005 without considering the arguments and analysis presented in the Reply of 11/25/2005. Both office

actions appear to have not applied accepted criteria for determining if a claimed invention produces a useful, concrete, and tangible result.

The analysis presented in the Reply of 11/25/2005 is reproduced here for the Examiner's convenience. The undersigned representative respectfully requests that the following remarks be considered, that the claims be allowed if conclusions reached in the remarks are valid or that specific rational as to why the remarks do not show that the claims are patentable be provided.

With regarding to Claims 21-30, the OA asserts:

... what is claimed appears to be nothing more than using a computer to perform Boolean operations, which is believed to be too preliminary to convey any disclosed practical applications.

... accumulating only result tuples from the set operations on all (boundary, boundary) indexing cells does not appear to be complete enough to produce a concrete, useful, and tangible result in a practical application.

Both statements amount to a summary rejection of the claims without application of analysis. Application of the PTO's own training materials<sup>1</sup> with regard to "useful, concrete, and tangible" shows that the claimed invention meets these criteria.

With regard to "useful:" the training materials state:

a) the utility need not be expressly recited in the claims, rather it may be inferred; (b) if the utility is not asserted in the written description, then it must be well established; ...

The claims positively recite the accumulation of *result tuples* that represent the product of a Boolean operation among a first and second region, e.g.:

*21. A method for performing Boolean operations in a digital computer ...  
accumulating result tuples, ...:*

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<sup>1</sup> <http://www.uspto.gov/web/menu/pbmethod/trangmaterials.ppt>.

*upon completing a cycle where at least one of a starting point remains untraversed or an intersection between region boundaries remains untraversed, accumulating result tuples, ...  
discarding duplicate tuples and tuples comprising only cell edges, until all starting points and intersections of the region boundaries have been traversed....*

That tuples that describe all or part of the result of a Boolean operation between two regions are useful is beyond doubt.

Further, there is no requirement that a claim recite steps well known to those skilled in the art. Methods for the accumulation of tuples in cells that are not (boundary, boundary) cells are well known; as are methods for concatenating tuples from each cell type to arrive at a final result. The specification makes this clear, e.g. (**bold emphasis added**):

*[0015] Fig. 5 illustrates a categorical approach for analyzing set operations that was developed by the inventor herein and is described in Antony, R., Principles of Data Fusion Automation (Artech House, 1995). When set intersection exists, set operation generation is treated as a three-stage (sub-problem) process involving the following canonical form classes.*

*[0016] Class 1: interactions between two interior cells;*

*[0017] Class 2: interactions between a boundary and an interior cell; and*

*[0018] Class 3: interactions between two boundary cells.*

*[0019] The first two stages entail only relatively trivial computations, and the appropriate methods for generating the products from both Class 1 and Class 2 are described in the Antony treatise, supra at 95. The third stage, however, is considerably more involved and effectively controls the computational complexity of the set operation generation process. Because both polylines and points can be treated as degenerate regions (regions with no "interior cells"), set union and intersection operations for these lower order features can be treated as a special case of the region generation methodology.*

*[0020] Consequently, it would be greatly advantageous to provide an optimal method for generating the product of the third, and key stage of the procedure: Class 3 interactions between two boundary cells.*

**As an independently sufficient basis for establishing the usefulness of the invention,** the specification recites several examples of the utility of embodiments of the invention, e.g.,

*[0003]... image processing, spatial data analysis, constraint-based reasoning, earth resource evaluation, crop management, market analysis studies, microfabrication, mining, weather forecasting, military planning, and utility management. For example,*

*rain forest shrinkage over time can be studied by performing Boolean set intersections between processed earth resource imagery and historical vector-represented geo=spatial map products depicting vegetation. ... Ground-based target locations for military applications can often be significantly refined by intersecting sensor generated error ellipses with domain features that favor the presence of such vehicles ...*

Here, in addition to the utility recited in the claims of *accumulating result tuples*, the written description contains several assertions of the utility of the invention.

With regard to “concrete,” the PTO states (at the same source as above):

Usually, this question <concreteness> arises when a result cannot be assured. An appropriate rejection ... should be accompanied by a lack of enablement (35 U.S.C. 112) rejection, ...

The specification provides detailed disclosure illustrating that the results of computer program products and methods of the technology can be assured. In fact, the specification points out that establishing and classifying indexing cells about two regions is known.

*[0056] Two of the steps are known (Antony treatise, supra at 95), and these include the steps of: establishing indexing cells about the two subject regions; and 2) distinguishing three canonical form classes of indexing cells ...*

The specification then provides detailed disclosure as to how each type of indexing cell is processed to perform a Boolean operation on the two regions.

The specification provides ample disclosure as to the assured nature of the results, i.e., concreteness.

With regard to “tangible,” the PTO states (same materials as above):

... the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. ... In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permits the

data structure's functionality to be realized, and is statutory.

In Claims 21-25, a method *for performing Boolean operations in a digital computer* is claimed. In Claims 26-30, a *computer program product* including a *computer readable medium* and various *modules* is claimed. In each case, the claims explicitly call for an interrelationship between the data structure (e.g., regions represented as vector tuples), and the computer software and hardware components (e.g., a digital computer, a computer program product) which permit the data structure's functionality (e.g., vector tuple representation of the result of a Boolean operation between regions) to be realized, i.e., a tangible result.

In summary, the claimed invention does produce a useful, concrete, and tangible result in that the claims and the specification assert multiple utilities for assured results from interrelated data structure (e.g., regions represented as vector tuples), computer software (claimed steps and module functionality), and computer structure (e.g., digital computer/computer readable medium/modules) which permit functionality (e.g., vector tuple representation of the result of a Boolean operation between regions) to be realized.

For the above reasons, the undersigned requests that the rejection of Claims 21-30 as being directed to abstract ideas be withdrawn.


**CONCLUSION**

No new matter has been added to the disclosure. An examination on the merits at your earliest convenience is respectfully requested. Please contact undersigned with any questions that will expedite prosecution.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 50-1458, and please credit any excess fees to such deposit account.

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